

What Protects Astronauts from Radiation in Space?

Standard Statement:

3.4.7 B - Relate energy sources and transfer to heat and temperature.

Content Objectives:

Students will be able to:

1. Determine the function of Mylar in space suits.
2. Determine what characteristics of Mylar make it an affective choice for protecting astronauts in space.

Process Objectives:

Students will be able to:

1. Complete a scientific inquiry to determine the function of a material.
2. Data collection and analysis.

Assessment Strategies:

1. Data collection and analysis of results to draw scientific conclusions.
2. Compose a written report on the results of the experiment.
2. Create a brochure.

Procedures:

1. Discuss with students the various types of electromagnetic radiation emitted from the sun and how the lack of an atmosphere in space exposes the astronauts to dangerous amounts of radiation.
2. Have students complete the following investigation.

Suggested Level:

Intermediate/Secondary

Standard Category:

3.4—Physical Science, Chemistry and Physics

Materials:

Two handheld
walkie-talkies
Television with remote
control
Sheet of Mylar
Radio with antenna
Flashlight

Instructional Strategies:

Experimentation
Cooperative learning
Research
Interpreting data

Related Concepts:

Understanding the space
environment

What Protects Astronauts From Radiation in Space?

Thought question to begin:

What common product is usually made from Mylar? _____

Investigation:

To decide on the effectiveness of Mylar in stopping radiation, complete the following investigation.

1. Give a walkie-talkie to a pair of lab partners.
2. Have a lab partner stand on either side of a doorway and tape a sheet of Mylar between them. Alternately, have a third partner hold a sheet of Mylar between the partners that are holding the walkie-talkies.
3. Try to communicate with each other using the walkie-talkies. Record your results.
4. Repeat the experiment without the sheet of Mylar between the partners. Record your results.
5. Take the sheet of Mylar cover the front end of the remote control from a TV. Try turning on the TV with the remote control. Record your results.
6. Try turning on the TV without the sheet of Mylar over the remote. Record your results.
7. Turn on a radio and set it to a channel with clear reception. Record your results.
8. Wrap a sheet of Mylar around the antenna and listen to the reception. Record your results.
9. Take a flashlight and try shining the light through the sheet of Mylar. Record your results.

Data Table:

Device	With Mylar	Without Mylar
Walkie-talkies		
TV remote		
Radio		
Flashlight		

Questions to ponder:

1. List the types of radiation in the electromagnetic spectrum.
2. What types of radiation are used to operate each of the devices you used in lab?
3. How did the Mylar affect each of these types of radiation?
4. Is Mylar an effective tool in stopping the types of radiation you tested?
5. What other properties of Mylar make it an ideal material for the astronaut's space suits?

Follow up Activity:

1. Give the results of your lab in a written report.
2. Create a pamphlet on the parts of an astronaut's space suit and the function of each layer of the suit. Present the brochure to the class.

Pamphlet

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria	Assessment			
	Points	Self	Teacher	Other(s)
1. Scientific content is accurate and supports the major sections of the pamphlet.				
2. The format used to layout the pamphlet is effective for the intended audience.				
3. The pamphlet is creative and interesting.				
4. The writing in the pamphlet is objective, clear and concise, has clear sentence structure and uses descriptive rather than figurative language.				
5. The pamphlet has all the following presentation elements: words and visuals are easy to see, titles and headings are easy to distinguish, and colors and patterns in pamphlet are pleasing.				
6. Diagrams, pictures, and other graphics are of quality and add to the overall effectiveness of the pamphlet.				
7. References are included and are correctly cited				
8. There are no errors in the mechanics (spelling and grammar.)				

O Comments	O Goals	O Actions

Lab Report

Name _____ Date _____ Course/Class _____

Task/Assignment _____

	Title/ Introduction	Background Research	Question/ Problem/ Hypothesis	Procedures	Data & Results	Conclusions	Language Usage
Weights →							
Expert 4	The title states clearly both the independent dependent variables and the results of the experiment. The title of the report is written in a clear declarative statement. The lead-in information is concise and develops a clear understanding of the report to follow. A concise abstract of the lab is provided and does not exceed 250 words. <input type="checkbox"/>	Relevant literature and prior observations are cited which provide much insight into the phenomena to be included in the report. <input type="checkbox"/>	The question or problem that the lab was designed to answer is well articulated. The hypothesis is eloquently stated in the "If-and-then" format. It predicts the influence of the independent variable on the dependent variable. <input type="checkbox"/>	The procedures for controlling and measuring the dependent variable are well defined and clear. A detailed, logical step-by-step set of procedures that were used for conducting the lab is listed. Safety concerns are listed among the procedures. <input type="checkbox"/>	Data tables and graphs are expertly and neatly completed and totally accurate. Patterns or trends in data are noted. Data analysis is thorough. <input type="checkbox"/>	A response to both the question and hypothesis is clearly and completely provided and is consistent with the data. Limitations and extrapolations of the data are cited. Questions for further study are developed. Unresolved questions and problems are listed. <input type="checkbox"/>	Language is used correctly and purposefully. All words are spelled correctly. The report is neat, legible, and presentable. <input type="checkbox"/>
Proficient 3	The title states both the independent dependent variables and the results of the experiment. The title of the report is written in a clear declarative statement. The lead-in information is concise and develops a clear understanding of the report to follow. <input type="checkbox"/>	Relevant literature and prior observations are cited which provide insight into the phenomena to be included in the report. <input type="checkbox"/>	The question or problem that the lab was designed to answer is listed. The hypothesis is stated in the "If-and-then" format. It predicts the influence of the independent variable on the dependent variable. <input type="checkbox"/>	The procedures for controlling and measuring the dependent variable are defined and clear. A detailed, logical step-by-step set of procedures that were used for conducting the lab is listed. Safety concerns are missing from the procedures <input type="checkbox"/>	Data tables and graphs neatly completed and totally accurate. Patterns or trends in data are noted. Data analysis is thorough. <input type="checkbox"/>	A response to both the question and hypothesis is provided. Some limitations and extrapolations of the data are cited. <input type="checkbox"/>	Language is used correctly and purposefully. Some words are misspelled, but with little or no effect upon the final product. The report is neat, legible, and presentable. <input type="checkbox"/>

Lab Report (continued)

	Title/ Introduction	Background Research	Question/ Problem/ Hypothesis	Procedures	Data & Results	Conclusions	Language Usage
Emergent 2	<p>The title is stated in a rambling, non-concise fashion. There is an attempt within the title to state both the independent dependent variables and the results of the experiment. The title of the report is written in a declarative statement. The lead-in information lacks conciseness and clarity.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Literature and prior observations are cited, but provide little insight into the phenomena to be included in the report.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>The question or problem that the lab was designed to answer is ill defined. The hypothesis is stated, but not in the "If-and-then" format.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Some of the steps are understandable; most are confusing and lack detail.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Data tables and graphs are completed, but lack accuracy. Patterns or trends within the data are difficult to discern. Data analysis lacks thoroughness.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Presents an illogical explanation for findings.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>For the most part, language is used correctly. However, many words are misspelled, impacting upon the final product. The report borders on being sloppy, illegible, and not presentable.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>
Novice 1	<p>The title is stated in a rambling, non-concise fashion. There is no attempt within the title to state the independent and dependent variables and the results of the experiment. The title of the report is written in a declarative statement. The lead-in information provides little or no information that leads into the report.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Literature and prior observations are not cited.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>The question or problem that the lab was designed to answer is not defined. There is no hypothesis.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Not sequential, most steps are missing or are confusing.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Data tables and/or graphs are missing information and are inaccurate. Consequently, patterns or trends within the data are not discernable. Little attempt is made at data analysis.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Presents an illogical explanation for findings and does not address the question that guided the lab.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>	<p>Language is used incorrectly and without purpose. Many words are misspelled, impacting significantly upon the final product. The report is definitely sloppy, illegible, and not presentable.</p> <div> <input type="checkbox"/> <input type="checkbox"/> </div>